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(54) **Reversible snap fixing device for a lighting apparatus to be encased in a support panel such as a false ceiling**

(57) A snap fixing device which allows easy and rapid mounting and removal of a lighting apparatus to be encased with a false ceiling or a similar panel. The device comprises an elongated laminar element (7) made of a resilient material and substantially bent to a V-shape, with one end pivotally connected with the apparatus body (1) and the other end bent, said element being slidingly engaged in a slot (10) of the body (1). A

projecting part (11) is provided near the bent end (9a), whereas an abutment block (12) is placed at the bending point of the laminar element (7). To fasten the apparatus when it is mounted, element (7) must slide into slot 10 until the projecting part (11) is tripped and abuts on body (1) and the laminar element bows, thus transmitting the fastening force to panel (3) through the abutment block (12).

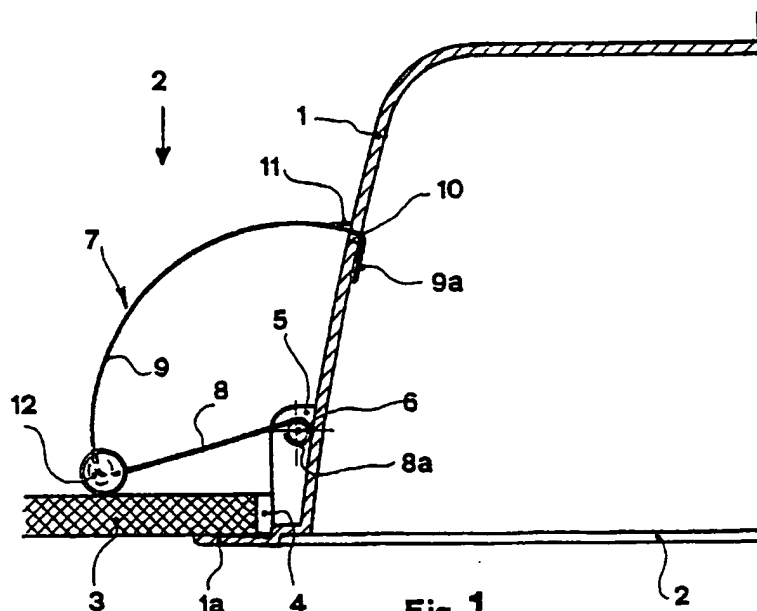


Fig. 1

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Description

The present invention relates to a reversible snap fixing device for a lighting apparatus to be encased in a support panel such as a false ceiling.

A well-known, popular system of this kind for small encased apparatuses uses at least one pair of arms elastically connected to the apparatus body and extending from it on diametrically opposed sides. The arms are forced against the front flange of the apparatus body so that the elastic reaction must be overcome by turning them approximately by 180° to make them pass through the opening in the false ceiling for mounting. Once the apparatus has been inserted, the arms are released and they push against the inner surface of the false ceiling, whereas the front flange forces the outer surface, thus locking the apparatus in its encased position. To remove the apparatus, it must be pulled out, to overcome the reaction of the elastically connected arms. This system is unsuitable for larger and heavier apparatuses, as the springs (which, for safety reasons, must be capable of supporting at least five times the weight of the apparatus) would require excessive pre-loading. Mounting and removal would therefore require too much effort.

Another system used for large encased apparatuses provides a cylindrical frame on which the apparatus body is mounted. At least two supports for flexible laminar elements are provided on the lateral surface of the frame, these elements being fixable by means of sliders moving along said supports and abutting against the inner surface of the false ceiling. This is a rather expensive system and mounting is difficult and uncomfortable, as first the frame has to be inserted in its hole, then, while holding it still in its position, the flexible laminar elements must be mounted and locked with the slider and, finally, the apparatus body has to be fixed by means of a screw or similar. It should be pointed out that the use of tools, as required in this case, makes mounting even more uncomfortable, considering that the installer has to work at a certain height above the ground.

In other known systems the flexible fastening arms can be retracted into the frame of the apparatus, allowing its insertion into the opening. The use of tools is required in this case too to fix the arms, and the apparatus body must be fixed to the frame.

A further fastening system provides flexible arms (usually three) which extend tangentially from the apparatus body. To mount the apparatus, the arms are drawn near the apparatus body and then released, once the apparatus is inserted. This solution is actually limited for use with a false ceiling which has the thickness for which the apparatus has been designed; in addition, removal is difficult and may damage the false ceiling.

It is an object of the invention to provide a fixing device for a lighting apparatus to be encased in a support panel, allowing the operations of mounting and removal to be both easy and rapid so that even non-experts are able to carry out them with a minimum of effort.

Another object of the invention is to provide a device of the type mentioned above, which does not impair the exterior appearance of the lighting apparatus.

A further object of the invention is to provide a device of the type mentioned above, which automatically fits various thicknesses of panels in which the lighting apparatus has to be encased.

These objects have been achieved with the reversible snap fixing device according to the present invention, comprising a first arm pivotally connected to the apparatus body near its front opening and extending from it laterally; a second arm made of a flexible material, which extends from the free end of the first arm, angled with respect to it so that its free end points towards the apparatus body. The latter free end is bent substantially perpendicular with respect to the development of the second arm, on an intermediate section of which a projecting part is provided. On the apparatus body a hole is made in which the second arm is slidingly engaged, so that it can be placed in a first or mounting position wherein the first arm substantially flanks the apparatus body and the second arm extends inside said body, and a second or locking position, wherein the first arm is turned by approximately 90° with respect to the previous position and the second arm is forcibly engaged against the lighting apparatus body by means of its projecting part, thus elastically forcing the first arm against the inner surface of the panel.

In this way, the second arm acts as a resilient strut between the lighting apparatus body and the panel in which it is encased, the panel being therefore placed between the first arm of said device and the perimetric external flange of the apparatus itself.

In a particular embodiment of the invention, the first arm and the second arm of the device consist of one single elongated laminar element, made of steel of suitable resiliency, bent to form substantially a "V" around an abutment block by means of which the thrust of the second arm is transferred to the panel.

Other features and advantages of the reversible snap fixing device for a lighting apparatus to be encased in a support panel such as a false ceiling, according to the present invention, will be apparent from the following description of one of its embodiment, which has to be intended only as an example and not a limitation, with reference to the drawings enclosed, in which:

- Figure 1 shows a side sectional view of an encased lighting apparatus fastened on a false ceiling by means of the fixing device according to the invention;
- Figure 2 shows a top plan view of the fixing device according to arrow 2 of Figure 1;
- Figure 3 shows an enlarged partial view of the connection between a flexible element of the device according to the invention and the lighting apparatus body;
- Figure 4 is a side view of the device according to

the invention;

- Figure 5 shows the device according to the invention in the mounting position of the lighting apparatus.

With reference to the above figures, it has been indicated with 1 the body of a known encased lighting apparatus of a known type, with a front opening 2 allowing the passage of the light beams produced and a perimetric flange 1a around the opening, and with 3 a support panel, e.g. forming a false ceiling, in which a hole 4 is made to house the apparatus.

Two radial fins 5 protrude from the external surface of body 1 near opening 2, and support a pivot 6 around which is mounted the end of a first arm 8, bent to form an eyelet 8a, of an elongated laminar steel element, generically indicated with 7, suitably flexible and substantially bent to a V-shape, to form first arm 8, which extends laterally from body 1, and a second arm 9 pointing towards body 1 and sliding in a slot 10 provided therein.

The free end 9a of second arm 9 is bent substantially perpendicular with respect to arm 9 itself, whereas from an intermediate point of arm 9 a tab 11, elevated with respect to the arm profile and obtained for example by shearing the latter, extends axially, substantially near the bent part 9a. A substantially cylindrical block 12, abutting on the inner surface of panel 3, is placed in correspondence of the bending point of laminar element 7, this point corresponding to the ends of first arm 8 and of second arm 9.

Naturally, two or more devices according to the invention, extending from body 1 at diagonally opposed sides or angled at 120° etc., are necessary to obtain a balanced fastening of the lighting apparatus to the false ceiling. Although this description refers to only one device as the others present substantially the same structure, it is understood that it relates to all these other devices, in particular as far as what concerns the operations of mounting and removal described below.

For the encased mounting in panel 3 of the lighting apparatus, provided with the fixing device according to the invention, the apparatus body 1 is introduced in hole 4 of panel 3, while the elongated laminar element 7, as shown in Figure 5, is arranged so that its first arm 8 flanks the external surface of body 1 and second arm 9 is completely housed inside body 1.

To fix the device on panel 3, the perimetric flange 1a of body 1 is held against the external surface of panel 3, while arm 9 is simultaneously slid in slot 10, so that it gets out from body 1 until element 12 abuts on the inner surface of panel 3. A force in a radial direction must then be exerted upon bent end 9a of arm 9, the thrust being transferred to panel 3 through pressing element 12, thus causing arm 9 to bow progressively as shown in figure 1. The bent end 9a is kept pushed until tab 11 is completely out of slot 10, being tripped and abutting against the external surface of body 1, whereas arm 9 abuts on the edge bordering slot 10. This operation must

be repeated on the other devices the apparatus is provided with, until it is completely fastened. In this way, two opposing forces act on panel 3, one exerted by the perimetric flange 1a of body 1 on its external surface and the other exerted by the pressing element 12 on its internal surface, thus the apparatus being firmly fastened to panel 3.

The operation of removal is likewise easy, as it is sufficient to push down arm 9 at its bent end 9a in order to trip tab 11 which disengages from body 1 and allows arm 9 to slide through slot 10 inside body 1, this operation having to be repeated for all the arms the apparatus is equipped with.

As shown in Figure 3, the surface of the spotlight can be provided with a special, substantially concealed seating 13 in which the bent end 9a is housed, once the apparatus has been fixed, preventing that the bent end 9a impairs the apparatus appearance. To make the installer's task easier, which requires operating on the bent end 9a for mounting or removing the apparatus, this end is embodied in a small plastic block 14 with the same shape of seat 13 which is, therefore, practically filled up to the level of the spotlight surface when tab 11 is engaged with the external surface of body 1.

The foregoing clearly shows that the operations of mounting and removal of a encased lighting apparatus are greatly simplified thanks to the fixing device according to the invention, which can be used with little effort and without tools. The time saved during mounting, even though it is limited when mounting one single apparatus, becomes an important factor for reducing installation costs when tens or hundreds of these apparatuses have to be encased in large rooms as often happens.

In addition, as the fixing device according to this invention is pivotally connected with the lighting apparatus body, it automatically fits the thickness of the panel within a relatively wide range and does not require specific models for each thickness or group of thicknesses.

Variations and/or modifications can be brought to the reversible snap fixing device for a lighting apparatus to be encased in a support panel such as a false ceiling as described above, within the scope of the appended claims.

Claims

1. Reversible snap fixing device for a lighting apparatus (1) to be encased in a support panel (3) such as a false ceiling, characterized in that it comprises:
 - a first arm (8) pivotally connected to the apparatus body near its front opening (2) and extending from it laterally;
 - a second arm (9) made of a flexible material, extending from the free end of said first arm and forming an angle with respect to it so that its

free end (9a) points towards said apparatus body, the latter free end being bent substantially perpendicular with respect to said second arm (9), a projecting part (11) being provided on an intermediate section thereof;

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- an opening (10) formed in said apparatus body, in which said second arm (9) is slidably engaged so that it can be placed in a first or mounting position, wherein said first arm (8) substantially flanks said apparatus body and said second arm (9) extends inside said body, and a second or locking position, wherein said first arm (8) is turned by approximately 90° with respect to said first position and said second arm (9) is forced against said body by means of its projecting part (11), thus flexibly forcing said first arm against the inner surface of said panel (3).

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2. Fixing device according to claim 1, in which said first and second arm consist of one single elongated laminar flexible metal element (7) bent substantially in a "V" shape.
3. Fixing device according to the previous claims, in which said elongated laminar element (7) comprises an abutment block (12) placed in correspondence of its bending point.
4. Fixing device according to claim 3, in which said abutment block (12) is a substantially cylindrical element.
5. Fixing device according to the previous claims, in which said projecting part (11) is a tab formed along said second arm (9), elevated with respect to the arm profile and having a free end for abutting against said body.
6. Fixing device according to the previous claims, in which said bent end (9a) is embodied in a shaped block (14) for engaging, in a substantially concealed way, in a corresponding seat (13) formed on the internal surface of said body.
7. Encased lighting apparatus characterized in that it comprises at least two symmetrically arranged reversible snap fixing devices to fix it to a support panel, such as a false ceiling, as claimed in any of the previous claims.

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